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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/891,213	06/26/2001	Shigeo Irie	740819-585	9379

22204 7590 09/17/2003

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EXAMINER

SAGAR, KRIPA

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 09/17/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/891,213	IRIE, SHIGEO	
	Examiner	Art Unit	
	Kripa Sagar	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) 5 and 6 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4 is/are allowed.
- 6) ☒ Claim(s) 1-3, 7 and 8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. The amendment filed 6/25/03 has been entered.
Claims 1,3 have been amended; new claims 7,8 have been added. No new matter has been introduced.
Claim 1-4, 7-8 are under consideration.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Pat. 6031598 to Tichenor et al. in view of US Pat. 5466942 to Sakai.

The claims recite an exposure method comprising the steps of cleaning a photomask of an unwanted film, exposing a substrate carrying a photoresist with EUV (extreme UV) radiation through a reduction exposure optical system and the cleaned mask. The cleaning of the mask is executed in a location different than the reduction-exposure optics chamber and using O-plasma and the cleaned mask is returned to the reduction exposure optical system.

Tichenor teaches an EUV lithography system. The system comprises diverse zones (Fig.1) that include a zone containing the wafer stage 16 and a reticle zone containing the reticle stage having a port 24. The reticle zone has a reticle robotics 14

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which permits the changing, *cleaning* or repair of the reticle away from the projection optics zone (5;19-37). The system is used to generate an *EUV beam* that is directed via the *mask* (reticle) and *reduction projection optics* (Fig.2) to *imprint* an image on a wafer (5;50-6;9).

Although Tichenor teaches a port for removal and cleaning of the reticle it does not *explicitly* teach removing an unwanted film from a mask. It does not teach cleaning a mask with O-plasma.

Sakai teaches cleaning electron-optical components to remove unwanted films deposited in the exposure chamber. These include apertures. This is prior art (1; 34-67). Sakai teaches that the part may be cleaned in-situ in the electron-beam apparatus using *reactive oxygen plasma* (2;3-13). In one embodiment the components are cleaned in a *separate chamber* from the apparatus (Fig.4) and returned to the e-beam column (7;14-35).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to clean unwanted contaminants from Tichenor's EUV mask using a separate chamber and O-plasma as taught by Sakai. The motivation arises from the facts that (a) it is conventional in the lithographic art and is a proven method for cleaning components with organic films (Sakai:1;34-67) and (b) separation of the cleaning chamber provides numerous advantages including reduced down-time and reduced capital costs (Sakai:7;36-43)

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4. Claims 1-3,7,8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tichenor in view of US Pat. 6279249 to Dao et al.

The teachings of Tichenor have been discussed above.

Tichenor does not teach cleaning the EUV mask with an O-plasma in a location displaced from the exposure chamber. It may be recalled that Tichenor provides a means for removing the mask from the exposure chamber for cleaning.

Dao teaches that EUV lithography is sensitive to contamination of the reticle (1;36-47 & 3;32-46). It teaches a method of transporting a reticle under protective atmosphere in a SMIF (Standard Mechanical Interface) pod for cleaning. The cleaned mask and cover (pellicle) are further cleaned of adsorbed and absorbed organic films by exposure to plasma (3;57-61). The cleaned assembly (mask + pellicle) is transported to the lithographic tool in the SMIF pod (5;30-35) under a protective atmosphere.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to clean Tichenor's EUV mask using Dao's cleaning method using a plasma, protecting the mask with a pellicle and an atmosphere in a SMIF pod and transporting the clean assembly to the lithography tool. Dao teaches that the technique not only reduces the contaminant film from the mask but also protects the mask from debris and prevents the re-deposition of organic films during transport (2;21-55).

Allowable Subject Matter

5. Claim 4 is allowed.

6. The following is an examiner's statement of reasons for allowance:

Claim 4 recites the steps of cleaning an unwanted film from a mask in a first chamber and transporting it *in-line* to a second chamber where a resist film is exposed to EUV through the mask.

Tichenor does not teach plasma cleaning an EUV mask. It does not teach cleaning the mask in a chamber in-line with the exposure chamber. Neither Dao nor Sakai teaches cleaning a mask in a first chamber and transporting it in-line to the exposure chamber.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

7. Applicant's arguments with respect to claims 1-4 have been considered but are not relevant in view of the new ground(s) of rejection.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 703-605-4427. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 703-308-2464. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

MH/ks



MARK F. HUFF
SUPERVISORY PATENT EXAMINER
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